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THE USE OF WAR GAMES IN COMMAND AND CONTROL ANALYSIS

Milton G. Weiner

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THE USE OF WAR GAMES IN COMMAND AND CONTROL ANALYSIS

Milton G. Weiner*

The RAND Corporation, Santa Monica, California

The increasing complexity of modern warfare, with its attendant requirement for rapid, reliable, comprehensive communications and decision making has focused mounting demands on command and control. While many of the problems involved are new, the command and control function has always been an essential part of organized military operations. Traditionally, this function has covered such diverse activities as determining the objective or mission of military operations, specifying the concepts, preparing the plans, directing and guiding the forces, and evaluating the outcomes.

However, the thermonuclear age has provided new difficulties in carrying out these functions, such as protecting the decision maker and his center of operations, improving the reliability and capacity of communications, establishing and maintaining limitations on weapon use, increasing coordination between military forces, and planning and executing military operations in severely degraded environments. Of late, considerable emphasis has been placed on technology to provide improved command and control by way of automated and semi-automated data processing equipment, protective construction, safety devices on weapons, etc.

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But underlying any attempt to solve the problems of command and control which have developed in the thermonuclear era is the need to understand the age old functions of any command and control system, i.e., the direction of military operations at all levels and under a variety of different circumstances.

An understanding of these functions is not easily acquired. A traditional source for the military analyst has been the history of past military operations. But we have no history of thermonuclear military operations. Even the military operations that have taken place have not been ones in which bilateral nuclear war has cast a very large shadow. As a result, to study command and control problems, we have had to seek other sources of experience with military operations under conditions of bilateral nuclear warfare.

It has been possible to derive some of this experience from logical extensions of peacetime planning and peacetime operations, some from tests, exercises, and mock combat situations. But a large part of the experience has not been adequate because of the artificialities that must, of necessity, be built into such exercises. Nor have attempts to develop machine simulations been adequate, since they lack several ingredients necessary to study command and control in operation. These ingredients we might call "the fog of war" and "the human equation." Machines, almost by definition, cannot deal with the fog of war, that strange world of uncertainties attendant upon our inability to know what the enemy will do, what failures or breakdowns of equipment and personnel will occur, what uncalculated events will take place in that highly intense situation of important actions and rapidly changing circumstances. The same is true of the human equation, that wide

range of human behaviors from the superbly rational to the totally irrational, which we can neither clearly comprehend nor totally regulate.

With the need to understand the relation of military command and control functions to its procedures and problems, it is not unreasonable that we turn to the devices capable of closely approximating military operations, i.e., to war games. An attempt to wed command and control operations to war games in order to understand the processes and problems of command and control is the subject of this paper.

As implied earlier this is not a task for a computing machine, although such machines may be of assistance. Nor is it a task for the armchair strategist, who cannot comprehend the massive, complex, and interwoven nature of full-scale, extended military operations. It is rather, a task for analysts with access to the full play of a synthetic military operation under conditions that permit them to delve in some detail in the day-by-day, step-by-step, development and execution of the war games.

Sometimes, of course, suitable synthetic military operations are not available for study. On the other hand, some war games developed and used for entirely different purposes may also be useful for command and control analysis. This was the lucky circumstance in which we found ourselves. The following sections describe the type of war game situations we had available and the way in which we examined the command and control aspects.

The war games of Project RED WOOD (and, earlier, Project SIERRA) of The RAND Corporation are used for examining various aspects of U. S. Air Force operations in limited war. Although the methodology of the games is extensively described in various unclassified publications,* several parts of the method deserve further mention.

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*Weiner, M. G., War Gaming Methodology, The RAND Corporation, Research Memorandum RM-2413, July 10, 1959.

The RED WOOD war games are two-sided, free-play games. Each game, of which there have been more than fifty, is based on a scenario that is made as realistic as possibly by the inclusion of a great many details of geography, terrain, military forces, military facilities, and logistic, political, and economic factors. The scenarios present both a general and a specific military situation. The games are true war games rather than simply battle games since they cover the events that lead up to the war, the detailed play of the war itself, and the establishment of some of the possible outcomes or consequences of the war. The detailed play of the war may represent a campaign of a week or a year, depending upon the particular situation. During the play of the game, every effort is made to handle the changing nature of the situation and the interplay of military, logistic, and political operations in a realistic manner.

The play is conducted through the interactions of three teams, the classic BLUE, RED, and CONTROL teams. Although the staffing of the teams may vary from game to game, the usual player team includes at least air, ground, and sea commanders, who are retired senior military officers experienced in planning and conducting military operations. The three military commanders are assisted by logistic specialists, political advisers, and technical experts.

The mechanics of the game follow a common pattern. Each side becomes familiar with the situation as presented by the scenario. Using this as a base, each side plans its military, logistic, and political operations in some detail. As an example, the air play is usually carried out to the detailed level of a single aircraft. Each side prepares military plans and mission logs that cover such aspects as the type of aircraft, the

deployment schedule of the aircraft and, when used in combat, the target, time schedule, weapon load, mission profile, armament, and takeoff and recovery airfields. This is done for all of the aircraft for each mission on every day of the war. Of course, for these limited war situations the number of aircraft involved is less than for strategic war situations. Nevertheless the number frequently goes into the hundreds. Special forms and bookkeeping techniques are of invaluable assistance in making this task less time consuming than it might appear.

For ground operations, the level of detail is usually the battalion, and includes such items as the rate of movement, firepower, logistic requirements under different conditions, and similar items. The usual naval unit is the individual ship or individual aircraft of the carriers.

The play consists of each side deploying and employing its forces according to the broad militar. plans that the side has established. This is translated into the specific missions assigned to the individual units of its force.

The game proceeds by move cycles, the number being determined by the particular situation. Each move cycle consists of the preparation of a detailed plan by each side, the evaluation of the plan by the CONTROL team, the assessment of the outcome by the CONTROL team, and the notification of each side of those aspects of the outcome to which his intelligence or reconnaissance capability entitles him.

The game is therefore a series of detailed moves within the framework of the larger military plan of the side. Events during the course of the war game often force a re-evaluation of the over-all war plan as well as frequent modification of the detailed plans, a condition which you recognize is also characteristic of the real world.

In summary, the games represent limited war situations in which experienced military, political, and logistic planners on opposing sides play through the full development of an extended war in considerable detail. As an aside, it might be pointed out that the use of a variety of techniques devised over the eight years the project has been operating makes it considerably less time consuming than the description might imply.

Project RED WOOD operations, then, offer some representation of the factors indicated earlier to be desirable for a commmand and control analysis, i.e., a rather complete, although synthetic, military situation, worked out in some detail, and including the human equation and many aspects of the fog of war. Looking at it in a more formal fashion, the war game provides a controlled situation for examining the interaction of various decision-making levels; it provides a dynamic situation for identifying changes in planning, command organization, and control operations, and it provides a basis for identifying the major decisions, information requirements, and information flow patterns, and their relations to the use of military force. It is these characteristics that make the synthetic situations useful for an analysis of the process and problems of command and control.

The question of how to use such war gaming situations has several answers. One could establish a hypothesis about command and control, and design a game that would test the hypothesis. For example, one might ask about the value of certain measures to protect essential command and control functions, and include these measures in a game to examine their significance. However there are immediate difficulties. What should we regard as "essential" functions? Should we allow or encourage the opposition to make these protective measures a high priority target for his military operations, etc.?

And, in general, what kinds of hypotheses should we develop when we are not clear as to the important characteristics of command and control functions?

Another possibility is to derive impressions from the war games and supplement them by interrogating the players as to the validity of the impressions. As anyone who has done a significant amount of war gaming is aware, the deriving of impressions from a war game, especially a manual war game, is risky business. Impressions are poor coin of the realm unless backed up with more detailed and analytic study.

A third possibility, and the one selected, was to treat the most recently completed game of the RED WOOD series as synthetic history. In doing this at least three major qualifications had to be recognized:

1. The game was not specifically designed for a command and control analysis. Our point of view was to treat the war game as a synthetic history, and to review it for implications for command and control operations in the same manner as one might review the Korean, Lebanese or Quemoy situations. There are, of course, several important differences. On the unfavorable side, the game is still a war game, with all that this connotes for those advocates of the unrealistic nature of war games. On the favorable side, the game was played under the assumed shadow of thermonuclear war. The players were continually aware of this possibility, and it had a major influence on the play of the game. In this sense the game had an advantage over an analysis of Korea. Because the game involved combat play, it had an advantage over Lebanon and Quemoy, which were limited to deployment. Also on the favorable side, the participants in the synthetic history, the players of the game, were available to cast light on the events that occurred and to provide reasons for decisions made and actions taken.

2. The game was not played as a type of command and control analysis. This offered both advantages and disadvantages. The examination of a game already played avoids any implication that the command and control questions asked or the answers given are in any way "rigged." On the other hand, the examination may not produce clear and sharp implications in the command and control area since no specific attempt was made to include these functions in the play of the game. Many of the important aspects might well lie in the shadows and be extracted from the play only by inference.

3. A similarity of problems and actions in the war game and those in the real world had to be assumed. This permitted a relatively detailed examination of the types of decisions made, the information and intelligence inputs required, the patterns of information used in decisions, the process of making military estimates of action and consequence, and the command and control coordination desired or presumed available for implementing the decisions. While all of these do take place in this type of war game, they are admittedly hypothetical. Their major promise is that they will shed some light on their real world counterparts and thus serve as leads for better understanding and further study.

With these qualifications in mind let us turn to a more detailed description of the method. First, only the command and control aspects of the BLUE side's operations were analyzed. Only lack of time prevented analysis of the operations of the RED side, which might have revealed some startling differences. Second, the method approached the whole problem backwards. Rather than starting with the command and control structure and organization, and attempting to examine its operations in the synthetic war, we started with the war and worked our way back to the command and control

operations. Instead of asking what the functions of command and control were and how they operated to bring military force to bear against the enemy, we asked what was the military force brought to bear and how did the command and control organization accomplish this?

The procedure was very straightforward, consisting of a series of questions posed to the available records of the game. Recall that the games provided considerable detail regarding day-by-day military operations and that the air action was handled on a mission-by-mission basis. Using this fact it was possible to ask the following questions, primarily for the air operations and to a lesser extent for the ground and naval operations and the related logistic and political actions:

1. What targets were attacked?

   By what forces?

2. Under whose command were the forces?

   Who controlled the forces?

3. How were these applications of forces decided?

   How coordinated?

4. Based on what information?

   How was this obtained?

With this simple list of questions it was possible to take each military event, such as an air strike, and follow it in detail, not from inception to accomplishment, but from accomplishment to inception. As you might imagine if you think of applying the same question list to an actual military operation, we began to accumulate a considerable amount of data and information on each of the events, and a number of patterns began to emerge. Two examples will serve to illustrate this.

Consider an air strike flown in support of a ground unit. The strike may be called for by the ground units because they are in a critical military situation. The target is not clearly identified, and the air strike may have to depend on ground control. The target is not one for which much advance planning can be done. It is one for which the air units have to do the best they can under the circumstances, i.e., it is adaptive rather than preplanned. It is one where initial coordination between air and ground forces is necessary, not only at the level of the immediate strike, but at higher echelons where the air strength for the day's operation is allocated. It is a strike generated by one of the air commands, and has to be coordinated with other air commands as well as ground commands. It is one where the commands very likely are operating under priority systems that depend upon the seriousness of the situation. It is one where the information on target selection and force assignment may have to cut across air and ground commands, and it is one where damage assessment and evaluation is needed in order that follow-up strikes be available.

As a second example, consider an attack against an enemy airfield. In this strike, an appropriate weapon must be selected and a compatible aircraft has to exist. It is one where pre-strike reconnaissance is of considerable value. It has to be coordinated with other air strikes, and preplanning is important. Target selection and force assignment may have to be done on a priority basis. It is one where post-strike reconnaissance would be of value.

These two illustrations show that examination of a large number of such strikes provides a large amount of information. This information includes

such items as the types of targets and their frequencies, the frequency of planned versus adaptive strikes, the amount of coordination required, the information flow patterns between lower and higher echelons of command, the frequencies of various types, kinds, and sources of reconnaissance information, the nature of the priority systems involved in target selection and force assignment, and the kinds of information necessary to carry out strike planning and scheduling.

Stated in other words, there is a considerable amount of information on the major functions of command and control and on some of the command and control problems encountered in a hypothetical war.

As would be expected, the list of questions and related data were very soon categorized and given impressive names. Since the names are convenient tags let me identify them. The four categories were targeting and force generation (what targets were attacked? by what forces?); command and control operations (under whose command were the forces? who controlled the forces?); decision sequence and pattern (how decided? how coordinated?); and intelligence and reconnaissance operations (based on what information? how obtained?).

From the information derived from the questions in each of the categories it was possible to identify relations between the categories. It became clear that there were identifiable interactions among the nature, sources, and types of intelligence and reconnaissance information, the types of decisions and the patterns of decision making, the structure and organization of command and control operations, and the types, nature, and selection of the attacking forces, the generation of attacks, and the targets that were attacked.

The analysis thus revealed a considerable amount of information on the way in which the command and control process worked, as well as on some of the problems of command and control. It should be kept in mind that although the analysis revealed much about both the process and problems of command and control, it did so for only one set of circumstances in one limited war situation. Nevertheless, the analysis did highlight the problems, and subsequent analyses of different circumstances or different situations may provide increased confidence in the validity of the findings.

Even for this initial work, however, it was possible to identify some interesting problems and some considerations for possible improvements and new developments. These were particularly in the major areas of reconnaissance and intelligence operations, command and control structure and organization, and force generation and targeting.

Since this presentation is concerned only with the technique that was used and not with a description of the specific war situation or the particular command and control problems identified or the possible improvements considered, I will not attempt to illustrate the latter. It is sufficient

From P. 3 → ~~to conclude~~ It is concluded that this analysis of command and control ~~provided~~ provides a new use for war gaming studies. In it, the detailed, dynamic representation of the situation, complete with the fog of war and the human equation, ~~were~~ are very important ingredients.